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PRE-APPEAL BRIEF REQUEST FOR REVIEW		Docket Number (Optional)	
		5649-1277	
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	10/801,208	03/16/2004	
	First Named Inventor		
	Kwang-hee Lee		
	Art Unit	Examiner	
	2892	Thanh Y. Tran	
Applicant requests review of the final rejection in the above-identified application. No amendments are being filed with this request.			
This request is being filed with a notice of appeal.			
The review is requested for the reason(s) stated on the attached sheet(s). Note: No more than five (5) pages may be provided.			
I am the		<u>D. Randal Ayers</u> Signature	
<input type="checkbox"/> applicant/inventor.		D. Randal Ayers Typed or printed name	
<input type="checkbox"/> assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96)		919/854-1400 Telephone number	
<input checked="" type="checkbox"/> attorney or agent of record. Registration number <u>40,493</u>		January 9, 2009 Date	
<input type="checkbox"/> attorney or agent acting under 37 CFR 1.34. Registration number if acting under 37 CFR 1.34 _____			
NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.			
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**RESPONSE UNDER 37 C.F.R. 1.116
EXPEDITED PROCEDURE
EXAMINING GROUP 2892**

Attorney's Docket No. 5649-1277

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Kwang-hee Lee et al.

Serial No.: 10/801,208

Filed: March 16, 2004

For: METHODS OF MANUFACTURING SEMICONDUCTOR DEVICES HAVING A
RUTHENIUM LAYER VIA AUTOMATIC LAYER DEPOSITION

Examiner: Thanh Y. Tran

Group Art Unit: 2892

Confirmation No.: 2034

Date: January 9, 2009

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**REASONS IN SUPPORT OF APPLICANTS'
PRE-APPEAL BRIEF REQUEST FOR REVIEW**

This paper is submitted in support of the Pre-Appeal Brief Request for Review filed concurrently with a Notice of Appeal in compliance with 37 C.F.R. 41.31 and the rules set out in the OG of July 12, 2005 in order to request a Pre-Appeal Brief Review of the final rejections of Claims 2-3 and 9-11 (Claims 4-8, 12, 14, 34-45 and 47 stand allowed). If any additional fee or extension of time for this request is required, this may be considered a petition therefore, and any additional fees may be charged, or refunds credited, to our Deposit Account No. 50-0220.

I. The Rejections of Claims 2-3 and 9-11

Claims 2 and 3 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent Publication No. 2002/0190294 to Iizuka et al. ("Iizuka"). Claims 9-11 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Iizuka. Applicants respectfully request reconsideration and withdrawal of the rejection of independent Claim 2, as well as the rejections of Claims 3 and 9-11 depending therefrom for the reasons discussed herein.

Claim 2 recites:

2. A method of fabricating a capacitor, the method comprising:
forming a lower electrode on a substrate;
forming a dielectric layer on the lower electrode; and
forming an upper electrode on the dielectric layer to provide a capacitor that comprises the lower electrode, the dielectric layer and the upper electrode;

wherein forming the lower electrode on the substrate comprises at least forming a ruthenium seed layer using atomic layer deposition on the substrate and forming a main ruthenium layer on the ruthenium seed layer using chemical vapor deposition.

In rejecting Claim 2, the Final Action takes the position that layer 34 of FIGS. 9I-9N of Iizuka corresponds to the ruthenium seed layer portion of the lower electrode of Claim 2, that layer 35 of FIGS. 9I-9N of Iizuka corresponds to the dielectric layer of Claim 2, and that layer 36a of FIGS. 9I-9N of Iizuka corresponds to both (1) the main ruthenium layer portion of the lower electrode and (2) the upper electrode of Claim 2. (Final Action at 2). Applicants respectfully submit that Iizuka, as interpreted in the Final Action, fails to disclose at least two (2) of the recitations of Claim 2, and hence fails to anticipate Claim 2.

A. The Final Rejection Improperly Interprets Layer 36a of Iizuka as Comprising Both a Lower Electrode and an Upper Electrode

The rejection of Claim 2 interprets layer 36a of FIGS. 9I-9N of Iizuka as corresponding to both the upper electrode of Claim 2 and the main ruthenium layer portion of the lower electrode of Claim 2. However, as is well understood to those of skill in the art, the same layer cannot act as both the lower electrode and the upper electrode of a capacitor, as such a structure would not function as a capacitor. As such, the layers identified in the Final Action as forming the lower electrode, dielectric layer and upper electrode of Claim 2 do not "provide a capacitor that comprises the lower electrode, the dielectric layer and the upper electrode" as is expressly required by Claim 2. Moreover, one of ordinary skill in the art would also understand that layer 36a of the capacitor of Iizuka cannot physically perform as both the upper electrode and part of the lower electrode of the same capacitor. Thus, to the extent that layer 36a of Iizuka as interpreted as comprising the upper electrode of Claim 2, then Iizuka fails to disclose a lower electrode of the capacitor that includes both a ruthenium seed layer and a main ruthenium layer. Alternatively, if layer 36a of Iizuka is interpreted as comprising the main ruthenium layer portion of the lower electrode, then Iizuka fails to disclose the upper electrode of Claim 2.

B. The Final Rejection Fails to Show that Iizuka Teaches Forming a Dielectric Layer on the Identified Lower Electrode

Claim 2 further recites "forming a dielectric layer on the lower electrode." It is axiomatic that the lower electrode must exist for one to be able to "form[]" a dielectric layer

on the lower electrode" as is recited in Claim 2. However, as is readily apparent from FIG. 9I and paragraph 0100 of Iizuka, layer 36a of Iizuka – which the Final Action identifies as comprising part of the lower electrode – is not formed until after the dielectric layer 35 is formed:

As shown in FIG. 9I, by using the ALD apparatus, a lower electrode metal 34 of TiN, a capacitor dielectric film 35 of ZrO_2 and an upper electrode metal 36a of TiN are continuously formed in the named order . . .

(Iizuka at ¶ 0100) (emphasis added). As such, the capacitor formation method of Iizuka that is set forth in the Final Action does not disclose "forming a dielectric layer on the lower electrode" as Iizuka expressly teaches that layer 36a – which the Final Action contends is part of the lower electrode – is not formed until after the dielectric layer is formed.

Applicants thus respectfully submit that Iizuka, as interpreted in the Final Action, clearly fails to disclose at least two of the recitations of Claim 2, and hence fails to anticipate Claims 2. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of Claim 2. Claims 3 and 9-11 each depend from Claim 2, and hence are patentable over Iizuka at least as depending from a patentable base claim.

II. Response to Arguments in the Advisory Action

In the Advisory Action mailed December 16, 2008, the Examiner first responds to the argument of Section II.A above as follows:

[A]pplicant argued that the same layer cannot act as both the lower electrode and the upper electrode of a capacitor. In response, the examiner disagrees with applicant's argument because figures 9I-9N of Iizuka et al clearly disclose a lower electrode 34 and an upper electrode 36a are separate layer/element (see paragraph [0111], Iizuka et al clearly discloses 34 and 36a as a lower electrode and an upper electrode).

(Advisory Action at 2). While Applicant agrees that Iizuka discloses a lower electrode 34 and an upper electrode 36a, what the Final Action states is that the upper electrode 36a of Iizuka corresponds to both the main ruthenium layer portion of the lower electrode of Claim 2 and to the upper electrode of Claim 2. The Advisory Action does not even attempt to respond to Applicant's showing that layer 36a of Iizuka cannot operate as both a lower electrode and an upper electrode, because it is physically impossible for a single conductive layer to act as both the lower and upper electrodes of a capacitor. Accordingly, the above-argument from the Advisory Action fails to justify maintaining the rejection of Claim 2.

The Examiner further responds in the Advisory Action to the argument of Section II.A above as follows:

Applicant further argued that the structure of Iizuka et al would not function as a capacitor. In response, the examiner disagrees with applicant's argument because Iizuka et al clearly discloses in figures 9I-9N the same structure as the claimed invention, thus it is capable of performing the same functionality.

(Advisory Action at 2). This argument, however, simply ignores the fact that the Final Action takes the position that layer 36a of Iizuka comprises both a lower electrode and an upper electrode. While Applicant appreciates that characterizing layer 36a as comprising both a lower electrode and an upper electrode is the only way that one can argue that Iizuka discloses a lower electrode that includes both a ruthenium seed layer and a main ruthenium layer, once the Final Action takes that position it is clear that Figs. 9I-9N of Iizuka do not have the same structure as the capacitor formed by the method of Claim 2. For example, the capacitor of Figs. 9I-9N of Iizuka, as characterized in the rejections, has lower and upper electrodes that are short-circuited to each other. This is clearly not the "same structure as the claimed invention" as argued in the Advisory Action. Accordingly, the above argument from the Advisory Action likewise fails to provide any support for maintaining the rejection of Claim 2.

Finally, the Examiner further responds in the Advisory Action to the argument of Section II.A above as follows:

Applicant further argued that Iizuka et al fails to disclose a lower electrode and an upper electrode comprising a Ru seed layer and a main Ru layer. In response, the examiner disagree with applicant's argument because Iizuka et al clearly discloses a lower electrode and an upper electrode can be selected from a group consisting Ru material (see paragraph [0133] and [0058]).

(Advisory Action at 2). This argument, however, mischaracterizes the point made in Applicant's previous response. What Applicants pointed out is that "to the extent that layer 36a of Iizuka as interpreted as comprising the upper electrode of Claim 2, then Iizuka fails to disclose or suggest a lower electrode of the capacitor that includes **both a ruthenium seed layer and a main ruthenium layer.**" While paragraphs 0133 and 0058 of Iizuka state that the lower or upper electrodes may be formed of ruthenium, **neither** paragraph discloses of suggests forming a lower electrode that "comprises at least forming a **ruthenium seed layer using atomic layer deposition** on the substrate **and** forming a **main ruthenium layer on the ruthenium seed layer using chemical vapor deposition**" as is recited in Claim 2. Thus,

In re: Hyunwoo Cho et al.

Serial No.: 10/806,903

Filed: March 23, 2004

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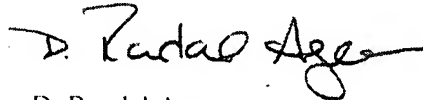
Applicants respectfully submit that the Advisory Action fails to rebut Applicants showing that the rejection of Claim 2 should be withdrawn.

Applicants further note that the Advisory Action does not even attempt to rebut the second basis for withdrawing the rejection of Claim 2 as set forth in Applicants' prior response and in Section II.B above.

III. Conclusion

For the foregoing reasons, Applicants respectfully request withdrawal of the rejections of Claims 2-3 and 9-11 and the passing of the present application to allowance.

Respectfully submitted,



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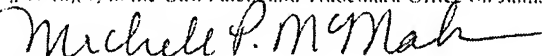
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Michele P. McMahon